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This guide is written for a combined physics-chemistry course taught over a two-year period. The subject matter contains the major ideas in Chemical Education Materials Study (CHEMS) Chemistry and Physical Science Study Committee (PSSC) Physics. The guide includes discussion of text references, laboratory experiments, films, testing and evaluation and a bibliography. It is suggested that the course be taught for two years with single daily periods, but the possibility of modification to a single year course is discussed. (BC)

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GUIDE FOR TEACHING

CHEMISTRY-PHYSICS COMBINED 1-2, 3-4

(PSSC - CHEMS)

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San Diego City Schools
San Diego, California
1966

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San Diego City Schools
San Diego, California
1966
Unedited

PREFACE

This publication is a tentative guide for teaching chemistry and physics in a combined course using the materials developed by the Chemical Education Materials Study and the Physical Sciences Study Committee. It presents the course schedule as a two-year sequence of single daily periods. With slight modification the same work could be accomplished in a single year with a double period scheduled daily or with various forms of flexible scheduling. It is also adaptable for team teaching or cooperative teaching arrangements.

The first year of the two-year sequence was used successfully in San Diego in 1965-66. The second year of the proposed sequence is outlined herein for trial use and evaluation in 1966-67. Revision of this unedited publication is planned for 1967.

Teachers using this guide are invited to submit suggestions for its improvement to the Specialist in Science Education, Curriculum Services Division.

Wm. H. Stegeman

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INTRODUCTION

THE COMBINED CHEMISTRY-PHYSICS COURSE

Traditionally the separate courses in chemistry and physics in the San Diego City Schools have been offered as electives at Grades 11 and 12, respectively. Combined Chemistry-Physics is an experimental course designed for students who would normally elect the regular classes in both chemistry and physics. It utilizes the equipment, materials, and approaches of the Chemical Education Materials Study (CHEMS) and the Physical Science Study Committee (PSSC) programs to integrate instruction in the basic physical sciences.

ADVANTAGES OF A COMBINED CHEM-PHYSICS COURSE

The study of chemistry and physics in a combined course offers the following advantages over the traditional offering as separate subjects:

A comprehension of many concepts in chemistry depends upon understanding energy relationships. These energy relationships are treated thoroughly in the study of appropriate physics materials early in the course.

Many topics such as the structure of matter, electrical phenomena, mechanics and behavior of gases are common to both chemistry and physics. Common unifying themes better portray to the student the physical world as a unified system.

Many of the investigative activities involved in chemistry and physics are basically similar. This engenders repetition, and whereas repetition increases the proficiency of developing certain techniques, it also limits the student's opportunity to treat topics in depth. Repetition is reduced in favor of depth study.

SEQUENTIAL DEVELOPMENT

The sequence of topics has been selected to present a logical development of understanding of the big ideas of physical science. The content is so arranged that at the end of the first year of the two-year sequence the student would have completed the equivalent of the first semester of chemistry (CHEMS) and one semester of physics (PSSC).

ORGANIZATION FOR INSTRUCTION

Although the course is outlined as a two-year sequence of single daily periods, it may be modified to fit in a single year of double periods. The utilization of team teaching or cooperative teaching by a chemistry teacher and physics teacher would offer several advantages over the teaching with a single instructor who would need ready access to the facilities and equipment necessary for teaching both subjects.

BASIC INSTRUCTIONAL RESOURCE MATERIALS

Basic Textbooks:

Physical Science Study Committee. Physics. Heath, 1965.

Physical Science Study Committee. Physics Laboratory Guide. Heath, 1965.

Chemical Educational Material Study. Chemistry: An Experimental Science. Freeman, 1963.

Chemical Educational Material Study. Chemistry: An Experimental Science, Laboratory Manual. Freeman, 1963.

Films:

PSSC Physics Film Series

CHEM Study Film Series

Tests:

PSSC Physics Achievement Tests

CHEM Study Achievement Tests

OBJECTIVES AND CONCEPTS

(Example: Unit I)

UNIT I. SCIENCE AND MATHEMATICS

A. Nature of Science

1. Introduction to the general nature of physics.
2. Activities of science.
3. Uncertainty in science.
4. Communicating scientific information.

B. Measurement

1. What is meant by measurement of time as interpreted to the observer and to changes in the physical world.
2. How physical changes are measured which occur in time intervals too long or too short to be observed directly.
3. Comparing times and counting units.
4. Times, large and small.
5. The direction of time.
6. The unit of distance.
7. Measuring large distances (triangulation).
8. Small distance measurement.
9. The dimensions of space.
10. Measuring surfaces and volumes.
11. Limitations of measuring.
12. Significant figures.
13. The unit of measurement.
14. Use of instruments for amplification of measurements.
15. Inherent limitation on the accuracy of any physical measurement.
16. Philosophy of measurement (calibration).
17. Measurement alters systems being measured, thus limiting precision of measurement.

C. Mathematical Operations

1. Mathematical relations.

   a. Proportions
   b. Equations
   c. Functions
   d. Tables
   e. Graphs

2. Methods of interpolation and extrapolation.
3. Inverse-square relationship.
4. The method of scaling.
5. Graphs - utilizing speed and distances, also varying speeds.

6. Instantaneous speeds calculations; the slope of the tangent line.
7. Vectors - addition and subtraction.
8. Velocity as a vector quantity.
9. Use of vectors in solving navigational problems.
10. Components of vectors.
11. Multiplying vectors by numbers and scalers.
12. Concept of vector acceleration.
13. Changing acceleration and the instantaneous acceleration vector.
14. Description of motion through choice of frame of reference.
15. The kinematic description of motion.

GENERAL OUTLINE: FIRST YEAR

		Approximate Time
I.	SCIENCE AND MATHEMATICS	6 weeks
	A. Nature of Science	
	B. Measurements in Science	
	C. Mathematics in Science	
II.	CHARACTERISTICS OF MATTER	8 weeks
	A. Mass	
	B. Atoms and Molecules	
	C. Phases of Matter	
	D. Organization of Elements	
III.	MOTION AND ENERGY	10 weeks
	A. Newtons Laws	
	B. Universal Gravitation	
	C. Momentum	
	D. Potential and Kinetic Energy	
	E. Thermal Energy	
IV.	ENERGY AND SOME CHEMICAL REACTIONS	12 weeks
	A. Heat and Chemical Reactions	
	B. Rates of Chemical Reactions	
	C. Types of Chemical Reactions	
	1. Chemical Equilibrium	
	2. Solubility Equilibrium	

TEXT REFERENCES FOR OUTLINE

I. SCIENCE AND MATHEMATICS

A. Nature of Science

CHEMS Chapter 1
PSSC Chapter 1

B. and C. Measurement and Mathematical Operations

PSSC Chapter 4
PSSC Chapter 2
PSSC Chapter 3
PSSC Chapter 5
PSSC Chapter 6

II. CHARACTERISTICS OF MATTER

PSSC Chapter 7
CHEMS Chapter 2
PSSC Chapter 8
CHEMS Chapter 3
CHEMS Chapter 4
PSSC Chapter 9
CHEMS Chapter 5
CHEMS Chapter 6
CHEMS Chapter 7

III. MOTION AND ENERGY

PSSC Chapter 20
PSSC Chapter 21
PSSC Chapter 22
PSSC Chapter 23
PSSC Chapter 24
PSSC Chapter 25
PSSC Chapter 26
CHEMS Chapter 7 (Review)

IV. ENERGY AND CHEMICAL REACTIONS

CHEMS Chapter 8
CHEMS Chapter 9
CHEMS Chapter 10

FIRST YEAR COURSE ITINERARY

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS* I	II	III	TOPIC
	1	Orientation.				Orientation.
	2	CHEMS Exp. 1.				Scientific observation and description.
Write up CHEMS Exp. 1.	3	CHEMS Exp. 2.				Behavior of solids on warming.
Write up CHEMS Exp. 2. Read CHEMS Exp. 3.	4	CHEMS Exp. 3.				Melting temperature of a pure substance.
Write up CHEMS Exp. 3. Read Exp. 4.	5	CHEMS Exp. 4.				Combustion of a candle.
Write up CHEMS Exp. 4. Read CHEMS 1-1.	6	Discussion of Lab. Experiments.				The activities of science and review of Lab. work.
Read CHEMS Exp. 5.	7	CHEMS Exp. 5.				Heat effects.
Write up CHEMS Exp. 5.	8	Discussion CHEMS Exp. 5.				Uncertainty in science.
Read and study CHEMS 1-2 through 1-4.	9	Recalculate CHEMS Exp. 5 using uncertainty and significant figures.				Uncertainty in science using significant figures.

*Problems are classified as: I, easiest; II, more difficult; III, more challenging.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Prepare for PSSC Exp. 1-4.	10	PSSC Exp. 1-4.				Analysis of an Experiment (introduction to functions).
Write up PSSC Exp. 1-4. Read and Study PSSC 4-1, through 4-3. Problems.	11	Discussion, PSSC 4-1 through 4-3. Graphic interpretation of Probs. 2,5,6,7,9,10,13, and 14.	1-7	9	8	Variation, functions, powers, interpolation and extrapolation.
Continue writeup of PSSC Exp. 1-4. Problems.	12	Discussion, PSSC 4-3 and problems.	10-12			Inverse square relation.
Complete PSSC Exp. 1-4. Read PSSC 4-4. Problems.	13	Discussion, PSSC 4-4. Do problems 15,16,18,20,21, 23 and 25. Film: "Change of Scale."	13,14 19,26	15-17 20,21,24 25	18 22,23	Scaling.
Read and study PSSC 2-1 through 2-6. Prepare PSSC Exp. 1-1.	14	PSSC Exp. 1-1.				Time and measurement.
Problems 7-11.	15	PSSC Exp. 1-1 (Continue for 20 min). Film: "Short Time Intervals" or "Time and Clocks."	1,2 5-9	3,4		Time and measurement.
Problems 12-14.	16	Demonstration of stroboscope operation. Problems 12-14 and introduction to "Orders of Magnitude."	11	10,12,13	14	Stroboscope orders of magnitude.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
PSSC 2-7 through 2-8.	17	Discussion problems 18-20.	15, 16 22, 25 26, 32	17,18,19 28-31	20,21	Orders of magnitude.
PSSC 3-1 through 3-5.	18	PSSC Exp. 1-2.	1-5	7,10,11,14	9,12,13	Large distances. Triangulation and parallax.
Problems PSSC 3-1 through 3-5.	19	Problem analysis. Film: "Measuring Small Distances." PSSC Exp. 1-3. (optional)	18,19 21,30	7,11,14,22 27,28	31	Small distances.
PSSC 5-1 through 5-3.	20	PSSC 5-1 through 5-2. Graphic analysis. Problem 3.	3	2,4		Speed, distance and varying speed.
PSSC 5-1 through 5-3. Problems.	21	PSSC 5-1 through 5-2. (Graphic analysis cont.) Problems 6 and 8.	6,9	7	8	Speed, distance and varying speed.
Read PSSC 5-4 through 5-6. Problems.	22	PSSC 5-4 through 5-6. Problem 16.	11,12 17,3	13,14,16		Distance vs. time. Speed and instantaneous speed.
Re-read PSSC 5-4 through 5-6. Prepare for PSSC Exp. 1-5. Problems.	23	PSSC Exp. 1-5.				Motion: Speed and acceleration.
Write up PSSC Exp. 1-5. Read PSSC 5-7. Problems.	24	Discuss PSSC 5-6; Graphic analysis of acceleration; Problems 19,21,22.	20	19,21,22		Acceleration.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
PSSC 5-8 through 5-9. Problems.	25	Discuss PSSC 5-7. Derivation of kinematic equations.		24,25	26	Kinematic equations.
PSSC 5-8.	26	Summary and problems 18,22,23. Film: "Straight Line Kinematics."		27,29	28	One-dimensional motion summarized.
PSC 5-1 through 5-9.	27	QUIZ.				
PSSC 6-1 through 6-2. Problems.	28	Discuss PSSC 6-1 through 6-2. Problem 3.	2,3	4		Trips, addition and subtraction of vectors. Velocity.
PSSC 6-3. Problems.	29	Continue discussion. Supervised problem-solving (2,4-7,9,11,14).	5	6		Trips, addition and subtraction of vectors. Velocity.
PSSC 6-4. Problems.	30	Discuss PSSC 6-3 through 6-4.	7,9,12	8,10	11	Components of vectors. Multiplying vectors by numbers and scalers.
PSSC 6-5. Problems.	31	Continue discussion; supervised problem-solving.	13-15			Components of vectors. Multiplying vectors by numbers and scalers.
PSSC 6-6. Problems.	32	PSSC 6-5 discussion.	16			Constant acceleration.
PSSC 6-7.	33	Discuss PSSC 6-6. Problems 19,20.	17,18	19,20		Changing acceleration.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
PSSC 6-8 through 6-9. Problems 25,26.	34	PSSC 6-7 through 6-9. Discuss problems 23 & 25.	21-23	25	24	Summary.
PSSC 6-1 through 6-9.	35	TEST.				TEST.
PSSC 7-1 through 7-6.	36	Discussion of PSSC 7-1 through 7-6. Problems 1,2,4,6,7,9.	1,2,3 8-11,13 15,17	4,5,7 12,14,16		Gravitational mass.
PSSC 7-7 through 7-9.	37	Discussion of PSSC 7-7 through 7-9. Problems 1,2,13.	18,21, 24	19,20 22,23		Chemical elements.
PSSC 7-10 through 7-15.	38	Discuss problems 1,3,4,7,9.	25	26		The atom.
Prepare for Exp. 6, CHEMS.	39	CHEMS Exp. 6.				Weight of gases.
Write up CHEMS Exp. 6. CHEMS 2-1.	40	Discuss CHEMS 2-1.	Ex 1 1,2			P. V. Behavior of gases.
Read CHEMS 2-2 through 2-2.2.	41	Discuss CHEMS 2-2 through 2-2.2. Film: "Gases and How They Combine."	3			Molecules, atoms, combining volumes.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Study CHEMS 2-2.3 through 2-2.5.	42	Discuss CHEMS 2-2.3 through 2-2.5.	Ex 2, 4	5	6	Relative weight of a molecule; diatomicity.
Study CHEMS 2-3 through 2-3.1.	43	Discuss CHEMS 2-3 through 2-3.1.	Ex 3, 7,8			Atoms in liquids and solids; elements, compounds.
Read CHEMS Exp. 7.	44	Start CHEMS Exp. 7.				Conservation of mass.
Read CHEMS 2-3.2 through 2-3.3.	45	Continue Chems Exp. 7. 2-3.2 through 2-3.3.	Ex 4, 9-13,15 20	14,16-19 22,24	21,25	Formulas; the mole.
Read Part 1, CHEMS Exp. 8. Study CHEMS 2-3.4 through 2-4.	46	Finish CHEMS Exp. 7 and start Exp. 8. Discuss CHEMS 2-3.4 through 2-4.	Ex 5-9, 23	26,27	28-31	Atomic molecular weights.
Write up CHEMS Exp. 7.	47	Discuss CHEMS Exp. 7. Review problems.				
Study for quiz.	48	QUIZ.				
PSSC 8-1 through 8-17.	49	Discussion of PSSC Chapter 8 and problems.	2,3,6 8,10,12	5,7,11 14-17	1,4,9 20	Atoms and molecules.
Study PSSC 8-1 through 8-17. Problems.	50	Discussion (Cont.) PSSC 8-1 through 8-17.	13,18 21-24,26 27,28	19,25,29 31,32,33	30	Atoms and molecules.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Finish reading CHEMS Exp. 8.	51	Continue CHEMS Exp. 8.				Conservation of mass.
Read CHEMS 3-1 through 3-1.2.	52	Finish CHEMS Exp. 8. Discuss quiz and CHEMS 3-1 through 3-1.2.	Ex 1-3,1	2,3		Formation and decomposition of water.
Write up CHEMS Exp. 8.	53	Discuss CHEMS Exp. 8.				
Study CHEMS 3-1.3 through 3-2.	54	Discussion.	Ex 4, 6	4,5		Equations.
Study CHEMS 3-2.1 through 3-2.2.	55	Discussion.	Ex 5,6 7	8,9	10,11	More on equations.
Read CHEMS 3-2.3.	56	Review.	Ex 7-10 12-14	15,16	17-19	Calculations from equations.
Review for quiz.	57	QUIZ.				
Study CHEMS 4-1.1 through 4-1.3.	58	Discussion.	Ex 1,2 1-3	4-6	7,8	Molar volumes: Arogadro's Hypothesis.
Study CHEMS 4-2 through 4-2.2.	59	Discussion.	Ex 3,4 9-11	12,13,15	14,16-18	Partial pressure.
Read CHEMS Exp. 9.	60	CHEMS Exp. 9.				Molar volume of H_2.
Write up CHEMS Exp. 9.	61	Discuss CHEMS Exp. 9.				

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Study CHEMS 4-2.3 through 4-2.4.	62	Film: "Gas Pressure and Molecular Collisions." Demonstration and discussion.	Ex 5,6 19,20	21,22	23,24	Absolute temperature.
CHEMS 4-3.	63	Problems review.				Review.
PSSC 9-1 through 9-5.	64	Discussion of assignment.	3,4,6-11 13-18	1,2,5,12		Nature of a gas.
Study PSSC 9-6 through 9-7. PSSC Exp. 1-9.	65	PSSC Exp. 1-9.	20,22,23 26-28	19,21,24 29	25	Molecular layers.
Study for test, CHEMS 1-4.	66	TEST.				TEST.
Study CHEMS 5-1 through 5-1.3.	67	Review test. Discuss assignment.	Ex 1-5 1,4,7	2,3,5 8-11	6,12	Pure substances.
Study CHEMS 5-2 through 5-2.5.	68	Discussion.	13,14,16	15,17,18	19	Solutions, Concentrations, Ppt. Reactions.
Prepare for CHEMS Exp. 10.	69	CHEMS Exp. 10.				Ppt. Reactions.
Read CHEMS 5-2.6 through 5-3.5.	70	Finish CHEMS Exp. 10. Film: "Electric Interactions in Chemistry."	Ex 6-8, 20-22	23,25	24	Electrical nature of matter.
Write up CHEMS Exp. 10.	71	Discuss CHEMS Exp. 10.				Ions and their reactions.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Study CHEMS 5-4 through 5-4.2.	72	Discussion of assignment. Demonstration, electrical conductivity.	Ex 9, 26	27, 29-31	28,32	Ions and their reactions.
Read CHEMS Exp. 11.	73	CHEMS Exp. 11.				Ionic reactions.
Write up CHEMS Exp. 11.	74	Discuss CHEMS Exp. 11.				
Read and study CHEMS 5-4.3 through 5-4.4.	75	Discussion and problems.				Ionic solids.
Review test.	76	TEST.				TEST.
Study CHEMS 6-1 through 6-1.5.	77	Discussion.	1,4,8	2,3,5 9-11	6,7	The nuclear atom.
Study CHEMS 6-2 through 6-2.4.	78	Discussion Film: "Chemical Families."	13	12,14,15		Periodic table; inert gases.
Study CHEMS 6-3 through 6-3.2.	79	Discussion.	Ex 1,16	17	18	Alkali metals.
Study CHEMS 6-4 through 6-4.3.	80	Discussion.	19,22	20,21		Halogens.
Study CHEMS 6-5 through 6-5.2.	81	Discussion.			23	Hydrogen.
Study CHEMS 6-6 through 6-7.	82	Discussion.	24	25-27	28,31	Third row elements.
Study; review for test.	83	TEST.		29,30		TEST.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Study CHEMS 7-1 through 7-1.1. CHEMS Exp. 13.	84	CHEMS Exp. 13.	1-3			Reaction heat, heat content "discovery" of additive law.
Study CHEMS 7-1.2 through 7-1.4.	85	Discussion, CHEMS Exp. 13.	Ex 1-3, 4,5	6,8,10 12	7,9,11 13,14	Use of additivity law.
Study CHEMS 7-2 through 7-2.4.	86	Discussion.		15,16	17	Kinetic and potential energy - chemical energy conservation.
Study CHEMS 7-3 through 7-4.1.	87	Discussion. Film: "Vibration of Molecules and Molecular Motions."	Ex 4	20	21-23	Nuclear energy.
Review CHEMS chapters 5-7.	88	Review CHEMS chapters 5-7.				Review.
Study for test.	89	TEST.				TEST.
	90	Review test.				Review test.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
	91	Introduction. Discussion. Film: "Forces." Demonstrate PSSC Exp. III-I.				Kinematics to dynamics.
Write up demonstration of PSSC Exp. III-I. Study PSSC 19-1 through 19-2.	92	Disucss PSSC 19-1 through 19-2. Interpret Fig. 19-5.	1,3,5			Forces and motion.
Prepare for PSSC Exp. III-2.	93	PSSC Exp. III-2.				Velocity change; constant force.
Write up PSSC Exp. III-2. Prepare for PSSC Exp. III-3.	94	PSSC Exp. III-3.				Acceleration, force, mass.
Write up PSSC Exp. III-3. PSSC 19-3 through 19-4.	95	Discuss PSSC 19-3 through 19-4. Graphic analysis of PSSC Exp. III-2 and III-3. Problem 4. Film: "Inertia."	7,8,12	10,11		Acceleration, force, mass.
PSSC 19-5 through 19-6.	96	Discuss PSSC 19-5 through 19-6. Film: "Inertial Mass."	13,14 16,17	15		Inertial and gravitational mass.
Prepare for PSSC Exp. III-4.	97	PSSC Exp. III-4.				Inertial and gravitational mass.
PSSC 19-7 through 19-11. Write up PSSC Exp. III-4.	98	Analysis of PSSC Exp. III-4. Discuss PSSC 19-7 through 19-11. Problems 16,19, 20,22,30.	18,19 25,26,27 28,31	29,30,33	32,34	Newton's law; force units net force; force reactors.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Problems and review.	99	Problems and quiz.				Newton's law; force units; net force; force vectors.
PSSC 20-1 through 20-2.	100	Discuss PSSC 20-1 through 20-2. Strobe analysis. Problems 1,2, 4-11, 17,18.	1-4 6,7	5,8,10 12	9,11	Weight and free fall.
Problems. PSSC 20-3.	101	Discuss PSSC 20-3. Problems 12-15.	13	15		Projectile motion.
Problems. PSSC 20-4.	102	Discuss PSSC 20-4. Film: "Falling Bodies" Intro. to PSSC Exp. III-5.	14			Projectile motion.
Write up PSSC Exp. III-5.	103	Discuss PSSC Exp. III-5. Demonstrate interpretation of PSSC Exp. III-5.				Projectile motion.
Prepare for PSSC Exp. III-6.	104	PSSC Exp. III-6.				Deflecting force; circular motion.
PSSC 20-5. Write up PSSC Exp. III-6.	105	Discuss PSSC 20-5. Film: "Deflecting Forces." Problems 19, 21-27.	20,17,18	16,22		Centripetal force.
Problems. PSSC 20-6.	106	Discuss PSSC 20-6. Problems.	19,20	23,24		Centripetal force.
Problems. PSSC 20-7.	107	Discuss PSSC 20-7. Satellite Problems.	21	25		Centripetal force.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
PSSC 20-8.	108	Discuss PSSC 20-8. Problem 30. Demonstrate simple harmonic motion. Film: "Periodic Motion."	26-29 31	30,32	33	Simple harmonic motion.
PSSC 20-9 through 20-11.	109	Discuss PSSC 20-9 through 20-11. Film: "Frames of Reference."	39	34,35	36,37,38	Frames of reference.
PSSC 21-1 through 21-6.	110	Discuss PSSC 21-1 through 21-6. Problems 1,3,5.	2,4,6 8,10 7,9	1,3,5,11 12		Planetary systems.
Problems. PSSC 21-7 through 21-8.	111	Discuss PSSC 21-7 through 21-8. Problems 10-13. Film: "Universal Gravitation."				Newton and universal gravitation.
Problems. PSSC 21-7 through 21-8.	112	Discuss PSSC 21-7 through 21-8. Problems. Film: "Elliptical Orbits".	13-15 17,18	16,19	20	Newton and universal gravitation.
PSSC 21-9 through 21-11.	113	Discuss PSSC 21-9 through 21-11.	21,24	22,23,25 27		Cavendish experiment.
PSSC 22-1 through 22-2.	114	Discuss PSSC 22-1 through 22-2. Intro. the two-body system.	1,2 3,5 4,8	6,7		Impulse, momentum.
Problems. Prepare for PSSC Exp. III-8.	115	PSSC Exp. 8.				Momentum changes.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Write up PSSC Exp. III-8. Problems.	116	Discuss PSSC Exp. III-8. Problems. PSSC 22-1 through 22-2.				Momentum changes.
PSSC 23-3.	117	Discuss PSSC 23-3. Momentum changes (use 2-d strobe pictures for analysis). Problems 10,13.	12	9,10	11	Momentum changes.
Problems. PSSC 22-4. Prepare for PSSC Exp. III-9.	118	Discuss PSSC 22-4. Problem 16. Strobe picture analysis. Demonstrate PSSC Exp. III-9.	13-15,18	16,17	19,20	Conservation of momentum.
Problems. Prepare for PSSC Exp. III-10.	119	PSSC Exp. III-10.				Conservation of momentum.
Write up PSSC Exp. III-10. PSSC 22-5.	120	Discuss PSSC 22-5 PSSC Exp. III-10. Intro. center of mass. Problem 24.	21-23	25	24	Center of mass.
Problems. PSSC 22-5 through 22-6.	121	Discuss PSSC 22-6. Analyze strobe figure. Problems.	29	28,30	26,27	Center of mass.
PSSC 22-7.	122	Discuss PSSC 22-7 using problems 24-26.		32		Conservation of momentum.
PSSC 22-7.	123	Discuss PSSC 22-7; Interacting forces, system isolation, horse-wagon paradox. Summary.				Interacting forces.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Review PSSC 22.	124	Review quiz.				Review quiz.
PSSC 23-1 through 23-3. Problems.	125	Discuss PSSC 23-1 through 23-3. 1,2,4,5.	4	1,2		Energy transfer work.
Problems. PSSC 23-1 through 23-3.	126	Discuss PSSC 23-1 through 23-3. Expand concept of work and energy. Problems 1-5.	5	3		Energy transfer work.
PSSC 23-4.	127	Discuss PSSC 23-4; momentum vs. kinetic energy. Problems 9,10.	6,7,8 11,12	9,10,13		Kinetic energy.
Problems. PSSC 23-5 through 23-7.	128	Discuss PSSC 23-5 through 23-7. Using figure 23-6.	14,16,17 18	15		Transfer of energy in collisions.
Prepare for PSSC Exp. III-11.	129	PSSC Exp. III-11.				Transfer of energy in collisions.
Write up PSSC Exp. III-11. Problems. PSSC 23-8.	130	Discuss PSSC 23-8. Problems 25,26,28	19,21 23,26,27	20,24 28	22,25	Transfer of energy in collisions.
PSSC 23-9 through 23-11.	131	Discuss PSSC 23-9 through 23-11. Problem 31.	29,34	30,31	32,33	Kinetic energy and momentum.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Problems. Review 23-1 through 23-11.	132	Discuss PSSC 23-1 through 23-11.				Loss of kinetic energy.
Problems. Review.	133	PSSC 23-1 through 23-11. Review quiz.				Kinetic energy.
PSSC 24-1.	134	Discuss PSSC 24-1, Fig. 24-1 through 24-6 and derivations. Problem 6.	1,2,4	3,5,7,8	6	Potential energy; the spring bumper.
PSSC 24-2.	135	Discuss PSSC 24-2. Analyze Fig. 24-7; 24-10. Problem 13.	9,12,15	10,11,14 16	13	Potential energy; the two-body system.
PSSC 24-3 through 24-4.	136	Discuss PSSC 24-3 through 24-4 with derivations and graphs. Problems 20-22.	17,18	20		Potential energy, gravitational.
Problems. Prepare for PSSC Exp. III-12.	137	PSSC Exp. III-12.				Changes in potential energy.
Write up PSSC Exp. III-12. Problems. PSSC 24-4.	138	Discuss PSSC Exp. III-12 with emphasis on graphic analysis. Problem 23.		22	23	Potential energy, gravitational.
PSSC 24-5 through 24-6.	139	Discuss PSSC 24-5 through 24-6, derivations. Problem 32.	24,25,26 31,32	27,28	33	Escape energy; escape velocity; binding energy.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Review PSSC 24.	140	Review quiz.				Review quiz.
PSSC 25-1.	141	Discuss PSSC 25-1. Problems 2,6.	1,3,6	2		Gas pressure.
PSSC 25-2.	142	Discuss PSSC 25-2. Problems.	7,8,9	11,12	13	Thermal energy.
PSSC 25-3. Prepare for PSSC Exp. III-14.	143	PSSC Exp. III-14.		15,17		Mechanical energy of bulk motions and internal energy.
Write up PSSC Exp. III-14. PSSC 25-3 through 25-4. Problems.	144	Discuss PSSC Exp. III-14. PSSC 25-3 through 25-4. Problem 12.	14,16			Equivalence of mechanical and thermal energy.
PSSC 25-5 through 25-6.	145	Discuss PSSC 25-5 through 25-6. Problems.	19,20 23,24	25	22	Heat flow and energy dissipation and temperature rise.
PSSC 25-7.	146	Discuss PSSC 25-7. Problem 30.	27,28	29	30,31	Conservation of energy.
Review CHEMS Chap. 7.	147	Review CHEMS Chap. 7.				Energy effect in chemical reactions.
Review CHEMS Chap. 7.	148	Review CHEMS Chap. 7.				Energy effect in chemical reactions.
Study for test.	149	TEST.				TEST.
CHEMS Exp. 14.	150	CHEMS Exp. 14.				Clock reaction.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
CHEMS 8-1 through 8-1.2.	151	Film: "An Introduction to Reaction Kinetics." Problems 1-9.	Ex 1, 1-4	5,6,8	7	Some factors affecting rate.
CHEMS 8-1.3 through 8-1.4.	152	Problems, CHEMS 9-14.	Ex 2, 9-11			Reaction mechanism.
CHEMS 8-1.5.	153	Problems, CHEMS 14-19.		13	12	Effect of temperature energy distribution.
CHEMS 8-2 through 8-2.2.	154	Problems, CHEMS 20-26. Film: "Catalysis."	14,20	15-19	21	Activation energy.
CHEMS 8-2.3.	155	Problems, CHEMS 26-27.		22		Catalysis.
Review and study for test.	156	TEST.				TEST.
Review CHEMS 5-1.1 to 5-1.3; 9-1 through 9-1.2.	157	Discussion. $NO_2 - N_2O_4$ demonstration.	Ex 1, 1,3-6	2		Recognition and dynamic aspects of equilibrium.
CHEMS 9-1.3 through 9-1.6.	158	Discussion. Film: "Equilibrium."	Ex 2, 8,10	7,9 11,12	13-16	Le Chatelier's principle.
Prepare for CHEMS Exp. 15.	159	Demonstration of $FeSCN^{+2}$ system. Introduce CHEMS Exp. 15.				

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Continue CHEMS Exp. 15.	160	Finish CHEMS Exp. 15.				
CHEMS 9-1.7 through 9-2.1.	161	Discuss CHEMS Exp. 15 and CHEMS 9-1.7 through 9-2.1.	Ex 3, 19	17		Applying equilibrium considerations.
CHEMS 9-2.2 through 9-2.3.	162	Problems. Discussion.	Ex 4,5	20-22	18,23 24	Law of chemical equilibrium.
CHEMS 9-2.4.	163	Discussion. Problems.	25	26		Factors determining equilibrium.
Study for test, CHEMS Chapter 9.	164	TEST.				TEST.
Review CHEMS Exp. 11 and 12. CHEMS 10-1 through 10-1.2.	165	Discussion.	1	2		Solubility as an equilibrium.
CHEMS 10-1.3 through 10-2. Start CHEMS Exp. 16.	166	Discussion. CHEMS Exp. 16.	Ex 1,2	3	4	Factors affecting solubility.
End CHEMS Exp. 16. CHEMS 10-2.1 through 10-2.2.	167	Discussion.	Ex 3-5, 5,6,9-11	7,12 13,16	8,14 15	Qualitative view of solubility.
CHEMS 10-2.3 through 10-2.6.	168	Discuss CHEMS Exp. 16. CHEMS 10-2.1 through 10-2.6.	Ex 6-10	17,19 22,23	18,20 21	Quantitative view KSP.
Review.	169	Work on problems.				Review.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Study for test. CHEMS Chapter 10.	170	TEST. CHEMS Chapter 10.				TEST.
Review CHEMS Chapters 8 and 9.	171	Review CHEMS Chapter 8 and 9.				Review CHEMS Chapters 8 and 9.
Review CHEMS Chapters 9 and 10.	172	Review CHEMS Chapters 9 and 10.				Review CHEMS Chapters 9 and 10.
Study for test. CHEMS Chapters 8-10.	173	TEST.				TEST.
General review for CHEMS test, Chapters 1-10.	174	Review CHEMS Chapters 1-10.				Review CHEMS Chapters 1-10.
Study for Final CHEMS.	175	TEST, CHEMS Final (Mid Semester).				CHEMS Study Final (Mid Semester).
Review PSSC Chapters 1-10, 19-25.	176	Review PSSC Chapters 1-10, 19-25.				Review.
Review (cont.), PSSC 1-10, 19-25.	177	Review (cont.), PSSC 1-10, 19-25.				Review.
Study for PSSC final.	178	PSSC FINAL TEST.				PSSC FINAL TEST.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Selected special experiments in CHEMS and PSSC.	179	Selected special experiments in CHEMS and PSSC.				Special experiments.

To the end of the school year.

SUGGESTED LAB. EXPERIMENTS

Text	Chapter	Lab Experiment
PSSC	1	
PSSC	2-5	I - (1)
PSSC	3-2	I - (2)
PSSC	3-3	I - 3 *
PSSC	4	I - (4)
PSSC	5-3	I - (5)
PSSC	7-2	I - (6)
PSSC	7-9	I - 7 *
PSSC	7-9	I - (8)
PSSC	9-4	I - 9 *
CHEMS	1	Exps. 1-5
CHEMS	2	6
CHEMS	2	7
CHEMS	3	8
CHEMS	4	9
CHEMS	5	10
CHEMS	5	11
PSSC	20-3	III - 2
PSSC	20-3	III - 3
PSSC	21-5	III - 6
PSSC	23-2	III - 8
PSSC	23-4	III - 9
PSSC	24-1	III - 11
PSSC	25-3	III - 12
CHEMS	7	13
CHEMS	8	14
CHEMS	9	15

Demonstrations

Demonstrations will be utilized from CHEMS and PSSC as well as other sources as the need arises and time permits.

*Optional

SUGGESTED FILMS

Title	Author and School		Text and Chapter
Short Time Intervals	C. L. Searle	M.I.T.	PSSC 2
Time and Clocks	John G. King	M.I.T.	PSSC 2
Long Time Intervals	Harrison Brown	Cal. I. Tech.	PSSC 2
Change of Scale (23 min.)	R. W. Williams	M.I.T.	PSSC 4
Straight Line Kinematics (33 min.)	Everett Hafner	(Univ. of Roch.)	PSSC 5
Vectors (28 min.)	A. V. Baez		PSSC 6
Atoms and Chemistry (21 min.)	Robert St. George	Cambridge	PSSC 8
Crystals (25 min.)	Allan Holden	Bell Telephone	PSSC 8
Behavior of Gases (15 min.)	A. V. Baez	P. S. S. C.	PSSC 9
Measurements (22 min.)	William Siebert	M.I.T.	PSSC 10
Gases and How They Combine (22 min.)	CHEMS	CHEMS	CHEMS 2
Gases Pressure and Molecular Collisions (21 min.)	CHEMS	CHEMS	CHEMS 4
Electrical Interations in Chemistry (21 min.)	CHEMS	CHEMS	CHEMS 5
Chemical Families (22 min.)	CHEMS	CHEMS	CHEMS 6
Forces (22 min.)	Jerrold Zacharias	M.I.T.	PSSC 20
Inertia (27 min.)	Ed Purcell	Harvard	PSSC 20

SUGGESTED FILMS (Cont.)

Title	Author and School		Text and Chapter
Inertia Mass (20 min.)	Ed Purcell	Harvard	PSSC 20
Falling Bodies (30 min.)	N. H. Frank	M.I.T.	PSSC 21
Deflecting Bodies (29 min.)	N. H. Frank	M.I.T.	PSSC 21
Periodic Motion (30 min.)	Donald Ivey, Patterson Hume	Univ. of Toronto	PSSC 21
Frames of Reference (26 min.)	Donald Ivey, Patterson Hume	Univ. of Toronto	PSSC 21
Universal Gravitation	Donald Ivey, Patterson Hume	Univ. of Toronto	PSCC 22
Elliptical Orbits (18 min.)	A. V. Baez		PSSC 22
Energy and Work (28 min.)	Dorothy Montgomery	Holin College	PSSC 24
Mechanical and Thermal Energy (22 min.)	Jerrold Zacharias	M.I.T.	PSSC 26
Molecular Motions (13 min.)	CHEMS	CHEMS	CHEMS 7
Vibration of Molecules (12 min.)	CHEMS	CHEMS	CHEMS 7
Introduction to Reactions Kinetics (13 min.)	CHEMS	CHEMS	CHEMS 8
Catalysis (17 min.)	CHEMS	CHEMS	CHEMS 8
Equilibrium (24 min.)	CHEMS	CHEMS	CHEMS 9

GENERAL OUTLINE SECOND YEAR

V. Continuation of Some Chemical Reactions

A. Review of:

1. Rates of Reaction
2. Equilibruim
3. Solubility Equilibrium

B. Aqueous Acid and Bases
C. Oxidation-Reduction Reactions
D. Stoichiometry

VI. Optics and Waves

A. Nature of Light
B. Reflection and Images
C. Refraction
D. Particle Model of Light
E. Introduction to Waves
F. Waves and Light

VII. Electricity and Magnetism

A. Some Qualitative Facts about Electricity
B. Coulomb's Law
C. Electric Fields
D. Electric Circuits
E. Magnetic Fields
F. Electromagnetic Induction and Electromagnetic Waves

VIII. Atomic Structure and Matter

A. The Atom
B. Photons and Matter Waves
C. Structure of Matter
D. Chemical Bonding

IX. Chemistry of the Elements

A. Carbon Chemistry
B. The Halogens
C. The Fourth-Row Transition Elements
D. Aspects of Biochemistry

TEXT REFERENCES FOR OUTLINE

V. Continuation of Some Chemical Reactions

CHEMS Chapter 8	Review
CHEMS Chapter 9	
CHEMS Chapter 10	
CHEMS Chapter 11	Six Weeks
CHEMS Chapter 12	
CHFMS Chapter 13	

VI. Optics and Waves

PSSC Chapter 11	Nine Weeks
PSSC Chapter 12	
PSSC Chapter 13	
PSSC Chapter 14	
PSSC Chapter 15	
PSSC Chapter 16	
PSSC Chapter 17	
PSSC Chapter 18	

VII. Electricity and Magnetism

PSSC Chapter 26	Seven Weeks
PSSC Chapter 27	
PSSC Chapter 28	
PSSC Chapter 29	
PSSC Chapter 30	
PSSC Chapter 31	

VIII. Atomic Structure and Matter

CHEMS Chapter 14	Eight Weeks
PSSC Chapter 32	
PSSC Chapter 33	
CHEMS Chapter 15	
PSSC Chapter 34	
CHEMS Chapter 16	
CHEMS Chapter 17	

IX. Chemistry of the elements

CHEMS Chapter 18	Five Weeks
CHEMS Chapter 19	
CHEMS Chapter 22	

SECOND YEAR COURSE ITINERARY

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
	180	Orientation.				Orientation.
Review CHEMS 8-1 through 8-1.5, pp. 125-132.	181	Discussion of assignment and problems.	1,4 9,10	6,8 13	7 12	Factors Affecting Rate. Reaction Mechanism. Effect of Temperature. Energy Distribution.
Review CHEMS 8-2 through 8-2.3, pp. 135-137.	182	Discussion of assignment and problems.	14,20	15,19 22	21	Activation Energy Catalysis. A Catalyzed Reaction.
Review CHEMS 9-1 through 9-1.6, pp. 142-150.	183	Discussion of assignment and problems.	3,6 8,10	2,7 9,12	13-16	Recognition and Dynamic Aspects of Equilibrium. Le Chatelier's Principle.
Review CHEMS 9-1.7 through 9-2.2, pp. 152-155.	184	Discussion of assignment and problems.	19	17,20	18,23 24	Applying Equilibrium Considerations. Law of Chemical Equilibrium.
Review CHEMS 9-2.3 through 9-2.4, pp. 155-159.	185	Discussion of assignment and problems.	25	26		Factor Determining Equilibrium.
Review CHEMS 10-1 through 10-2, pp. 163-169.	186	Discussion of assignment and problems.	1,5,10	7,12,16	4,14,15	Solubility as an Equilibruim. Factors Affecting Solubility.
Review CHEMS 10-2.1 through 10-2.6, pp. 169-176.	187	Discussion of assignment and problems.		17,22,26	18,21 24,25	Qualitative View of Solubility Quantitative View Ksp.
Study for CHEMS Test Chapters 8-10.	188	TEST.				Test CHEMS Chapters 8-10.
Read and Study CHEMS 11-1 through 11-1.3, pp. 179-182.	189	Discussion of assignment.	Ex 1, 1		2	Strong and Weak Electrolytes, Water.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Read Exp. 17, CHEMS	190	CHEMS Exp. 17, Demonstration 5				Heat of Acid-Base Reaction.
Read and study CHEMS 11-2 through 11-2.4, pp. 183-185.	191	Discussion of assignment.		3	4,5	Properties and Definitions.
Read Exp. 18, CHEMS	192	Exp. 18.				Indicators.
Read and study CHEMS 11-2.5 through 11-2.7, pp. 185-189.	193	Discussion of assignment.	Ex 4	10,22,23	7	Titration, pH. Nature of H+ (aq).
Read and study CHEMS 11-3 through 11-3.2, pp. 190-193.	194	Discussion of assignment.	Ex 5, 11	13,15	16,17	Acid Strength and Equilbrium.
Read Exp. 19.	195	Exp. 19.				Le Chatelier's Principle.
Read and study CHEMS 11-3.3 through 11-3.5, pp. 193-195.	196	Discussion of assignment.	18	19,20 24	21	Bronsted Theory.
Review CHEMS, Chapter 11.	197	Film: "Acid-Base Indicators" Review CHEMS, Chapter 11.				Review CHEMS, Chapter 11.
Study for test, CHEMS, Chapter 11.	198	Test, CHEMS, Chapter 11.				Test.
Read CHEMS, Exp. 20.	199	Exp. 20.				Redox Reactions.
Read and Study CHEMS, 12-1 through 12-1.4, pp. 199-207.	200	Film: "Electro-chemical Cells" Discussion.	2	5,7,8	6	Cells.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Read Exp. 21, CHEMS	201	Exp. 21.				Electrochemical Cells.
Read and study CHEMS 12-2 through 12-2.1, pp. 207-212.	202	Discussion of assignment.	Ex 3	10,11	12,13	Electron-losing Tendency E^o.
Read and study CHEMS 12-2.5 through 12-3.3, pp. 215-220.	203	Discussion of assignment.	Ex 7-9, 18	19-22	23	Oxidation Numbers. Balancing Redox-Reactions.
Read and study CHEMS 12-4, pp. 220-221, Review CHEMS, Chapter 12.	204	Discussion of assignment. Review CHEMS, Chapter 12.	Ex 10		24	Electrolysis.
Study for test, CHEMS Chapter 12.	205	Test.				Test, CHEMS Chapter 12.
Read and study CHEMS 13-1 through 13-2.1, pp. 225-226.	206	Discussion of assignment.	Ex 1, 1,2	4,5	6	Mole Method Weight Problems.
Read CHEMS, Exp. 23.	207	Exp. 23				Titration.
Read and study CHEMS 13-2.2 through 13-2.5, pp. 226-230.	208	Discussion of assignment.	Ex 2,3 7-9, 13,14	10-12 15-18 21	19,20 22,23	Gas Volume, Solution Problems
Study for CHEMS test, Chapter 13.	209	Test CHEMS Chapter 13.				Test CHEMS Chapter 13.
Study and Review CHEMS Test Chapters 11-13.	210	Test CHEMS Chapters 11-13.				Test CHEMS Chapters 11-13.
Read and Study PSSC 11-1 through 11-8, pp. 188-197.	211	Discussion of assignment and prob. 5,7,8,9, 10,14.	9,17 18	3,5-8 10,14,19	16	Sources of Light. Transparent Colored and Opaque Materials. Reflection.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Continue assignment of prob. PSSC, Chapter 11.	212	Film: "Introduction to Optics." Discussion of problems.				How Light Travels. Diffraction-Speed of Light.
Read and study PSSC 12-1 through 12-2, pp. 200-203.	213	Discussion of assignment problems 2,3.	2	3		Shadows. Light Beams-Rays.
Read PSSC, Exp. 11-1.	214	PSSC, Exp. 11-1.				Images Formed by a Concave Mirror.
Read and study PSSC 12-3 through 12-5, pp. 203-207.	215	Discussion of assignment, Problem 11.	9	11	10,12 13	Locating Objects. Laws of Reflection. Images in Plane Mirror.
Read and study PSSC 12-6 through 12-7, pp. 207-209.	216	Discussion of assignment problems.	14,15			Parabolic Mirrors. Searchlights.
Read PSSC, Exp. 11-2.	217	PSSC, Exp. 11-2.				Images Formed by a Concave Mirror.
Read and study PSSC 12-8 through 12-10, pp. 209-216.	217-218	Discussion of assignment, problems 17,20, 28,29.	19,22,23	17,20,24 28,30	21,27 29	Astronomical Telescopes. Images and Illusions. Real and Virtual Images.
Read PSSC, Exp. 11-3.	219	PSSC, Exp. 11-3.				Refraction.
Read and study PSSC 13-1 through 13-3, pp. 220-226.	220	Discussion of assignment and problems 3,10.	1,2,6	3,10		Refraction-Angles of Refraction-Index of Refraction-Snell's Law.
Read and study PSSC 13-4 through 13-6, pp. 226-229.	221	Discussion of assignment and problems 11,15, 17.	13,17,18	11,15	14	Absolute Index of Refraction. Passage of Light from Glass or Water to Air. Passage of Light from Glass to Water.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Read and study PSSC 13-7 through 13-8, pp. 229-233.	222	Discussion of assignment and prob. 19,20,23,26.	19	22,25,26	20,23	Total Internal Reflection. Refraction by Prisms Dispersion.
Read and study PSSC 13-9 through 13-11, pp. 233-236.	223	Discussion of assignment and problems 27,31, 34.	29,30,32	27,28,31 34	33	Convergence of Light by a Set of Prisms. Lenses. Real Images Formed by Lenses.
Read and study PSSC 14-1 through 14-2, pp. 241-245.	224	Discussion of assignment.	1,5	2,6,7		Reflection and Refraction.
Read PSSC, Exp. 11-5.	225	PSSC, Exp. 11-5.				The "Refraction" of Particles.
Read and study PSSC 14-3 through 14-5, pp. 245-248.	226	Discussion of assignment and problems 10,12.	13,17,19	10-12,16	15	Source Strength and Intensity of Illumination. Light Pressure Absorption and Heating.
Finish previous assignment.	227	Film: (1) "The Pressure of Light," (2) "The Speed of Light."				Pressure and Speed of Light.
Read and study PSSC 14-6 through 14-8.	228	Discussion of assignment and problems 25-27,28.	27,28	22,23,24 25	26	Speed of Light. Particle Model.
Review PSSC, Chapters 11-14.	229	Review				Review PSSC 11-14.
Study for test, PSSC Chapters 11-14.	230	Test PSSC 11-14.				Test.
Read and study PSSC 15-1 through 15-3, pp. 254-261.	231	Discussion of assignment and problems 2,5,6, 9,10,11,13.	2,9	5,6,10 11	13	A Wave - Waves on Coil Springs- Super-position: Pulses Crossing.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Read PSSC, Exp. 11-6.	232	PSSC Exp. 11-6.				Waves on a Coil Spring.
Finish problems assigned (231).	233	Film: "Simple Waves," continuation of problems (231).				Simple Waves.
Read and study PSSC 15-4 through 15-6.	234	Discussion of assignment and problems 14,15, 19,21.	15,18,24	14,20,23 25	19,21	Reflection and Transmission. A Wave Model for Light.
Read and study PSSC 16-1 through 16-3, pp. 268-271	235	Discussion of assignment and problems 6,7,9.	4,5	6	7,8,9	Water Waves. Straight and Circular Pulses. Reflection.
Read PSSC, Exp. 11-7. Read and study PSSC 16-4, pp. 271-273.	236	PSSC, Exp. 11-7, problems 13,15.	13,14	15	16	Pulses in a Ripple Tank. Speed of Propagation and Periodic Waves.
Read PSSC, Exp. 11-8. Read and study PSSC 16-5, pp. 273-275.	237	Lab Demonstration, problems 22,23,25.	19	21,22,23 24	25	Periodic Waves. Refraction.
Read PSSC, Exp. 11-9. Read and study PSSC 16-6, pp. 275-276.	238	Lab Demonstration, problem 26.		26,27		Refraction of Waves. Dispersion.
Read PSSC, Exp. 11-10. Read and study PSSC 16-7, pp. 276-278.	239	Lab Demonstration, problem 29.	28,29	30,31		Waves and Obstacles. Diffraction.
Read and study PSSC 17-1 through 17-2, pp. 282-285.	240	Discussion of assignment, problems 5,8.	3,8	5,6,9		Interference on a Spring. Interference from Two Point Sources.
Read Exp. II-11.	241	PSSC Exp. II-11.				Waves from Two Point Sources.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Read and study PSSC 17-3 through 17-5, pp. 286-291.	242	Discussion of assignment and problems 16,17, 20,24,25.	13,18,20	15,16,19 12,23,24 25	17,26,27	Wave Lengths, Source Separation and Angles. Shape of Nodal Lines. Phase.
Read PSSC, Exp. II-12.	243	Lab Demonstration, Film: "Sound Waves in Air."				Interference and Phase.
Review problems PSSC, Chapter 17.	244	Problems PSSC, Chapter 17.				Problems.
Read and study PSSC 18-1 through 18-4, pp. 295-301.	245	Discussion of assignment and problems 2,5,6,8.	3,4,8	2,5,6		Interference of light. Young's Experiment. Phase of Light Sources-Atoms Color and Wave Length of light.
Read PSSC, Exp. II-13.	246	PSSC Exp. II-13.				Young's Experiment.
Read and study PSSC 18-5 through 18-8, pp. 301-307.	247	Discussion of assignment and problems 12,15, 18,21.	14,20,22	11,12,15 17,18	16,21	Diffraction: An Interference Effect in Single Slits. Theory of Diffraction by a Slit. Single and Double Slits. Resolution.
Read PSSC, Exp. II-14.	247	PSSC, Exp. II-14.				Diffraction of Light of a Single Slit.
Read and study PSSC 18-9 through 18-12.	248	Discussion of assignment and problems 28,31.	27	28,29,30 30		(1) Interference in Thin Films. (2) Interference in Light Transmitted Through Thin Films. (3) Color Effect in Interference.
Study and review PSSC Chapters 15-18.	249	Review PSSC, Chapters 15-18.				Review
Study for Test, PSSC Chapters 15-18.	250	Test PSSC, Chapters 15-18.				Test

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Read and study PSSC 26-1 through 26-3, pp. 464-467.	251	Discuss assignment.	1,3	2,4		Attraction and repulsion. Electric Forces. Insulators and Conductors.
Read PSSC, Exp. IV-1. Read PSSC, Exp. IV-2.	252	PSSC Exp. IV-1. PSSC Exp. IV-2.				Electrified Objects. Electrostatic Induction.
Read and study PSSC 26-4 through 26-6, pp. 467-473.	253	Discuss assignment, problems 3,7.		6	7	Electroscope. Electrostatic Induction. Electrometers.
Read and study PSSC 26-7 through 26-10, pp. 473-476.	254	Discuss assignment, problem 12.	13,16	12,14,15		Batteries. Electric Currents. Ionization. Wilson Cloud Chamber.
Read and study PSSC 26-11 through 26-13, pp. 476-481.	255	Discuss Assignment. Film: "Cloud Chamber," problem 20.		20,22,23		Conductivity of Solutions. Electrons in Metals. Diodes. Electron Guns. Cathode-Ray Oscilloscopes.
Read and study PSSC 27-1 through 27-2, pp. 483-486.	256	Discuss Assignment. Film: "Coulomb's Law," problems 2,3.	2,3,4,5		6,7	Force vs. Distance. Electric Charge and Force.
Read PSSC, Exp. IV-3.	257	PSSC Exp. IV-3.				The Force Between Two Charged Spheres.
Read and study PSSC 27-3 through 27-4, pp. 486-494.	258	Discuss assignment, problems 13,14.	13	12,14		Electric Force Fields. Measuring Small Electric Forces.
Read and study PSSC 27-5, pp. 494-497.	259	Discuss assignment. Film: "Electric Fields."		15		The Elementary Charge.
Read and study PSSC 27-6 through 27-7, pp. 497-500.	260	Discuss assignment. Film: "Millikan Experiment," problems 21,22.	17,18	19,21,22	23	A Large Electric Balance. The Constant in Coulomb's Law.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Read and study PSSC 27-8 through 27-9, pp. 500-501.	261	Discuss assignment, Film: "Coulomb's Force Constant."		24		Conservation of Charge. Electric Charge of Electrons and other Particles of Matter.
Review PSSC Chapter 27.	262	Film: "Electric Lines of Force," problems.				Problems in PSSC Chapter 27.
Read and study PSSC 28-1 through 28-2, pp. 506-513.	263	Discuss assignment, problems 5,8,10.	2,4,9	5,8,10		Mass of Electron and Proton Electric Current.
Read and study PSSC 28-3 through 28-4, pp. 514-517.	264	Discuss assignment, Film: "Counting Electrical Charges in Motion."	12	11		Electrolytic Measurement of Electric Currents. Energy Transfer, Electric Forces, and Elementary Charges.
Read PSSC Exp. IV-7.	265	PSSC Exp. IV-7.				The Charge Carried by Ions in Solution.
Read and study PSSC 28-5 through 28-6, pp. 517-521.	266	Discuss assignment, problems 18,26.	16	17,18,25 26	27	EMF and Energy Supplied by a Battery. Electric Field and Potential.
Read and study PSSC 28-7 through 28-8, pp. 522-524.	267	Discuss assignment, problem 15.	15,24	23		Batteries, Volts, Amperes.
Read and study PSSC 29-1 through 29-2, pp. 528-534.	268	Discuss assignment, problem 7.	5,11	7	6,8	Conductors, Batteries and Potential Difference. Measuring Potential Difference.
Read and study PSSC 29-3 through 29-5, pp. 534-540.	269	Discuss assignment, Film: "Elementary Charges and Transfer of Kinetic	19,20	17,23	12,13 18,21	Current vs. Potential Difference. Overall View of Electric Currents

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Review PSSC Chapters 28 and 29.	270	Review PSSC Chapters 28 and 29, problems 12, 27.	24	25	26,27	Review PSSC Chapters 28 and 29.
Read and study PSSC 30-1 through 30-4, pp. 546-554.	271	Discuss assignment, problem 7.	6	7,8		Magnetic Needle. Magnetic Fields. Vector Addition of Magnetic Fields. Forces on Currents in Magnetic Fields. Unit of Magnetic Strength.
Read PSSC Exp. IV-10.	272	PSSC Exp. IV-10.				The Magnetic Field of a Current.
Read and study PSSC 30-5 through 30-6, pp. 554-558.	273	Film: "A Magnetic Laboratory," Discussion of assignment, problem 13.		12,14	13	Meters and Motors. Forces on Moving Charged Particles in a Magnetic Field.
Read and study PSSC 30-7 through 30-9, pp. 558-561.	274	Film: "Electrons in a Uniform Magnetic Field," Discuss assignment.	19,23,26	21,25,27	20	Using Magnetic Fields to Measure the Mass of Charged Particles. Alpha Particles. Magnetic Field near a Straight Line.
Read and study PSSC 30-10 through 30-11, pp. 561-566.	275	Discuss assignment, problems 20,33.	31	32,33,34	24	Circulation. Uniform Magnetic Fields.
Review PSSC, Chapter 30.	276	Film: "Mass of an Electron," Discuss problems, chapter 30				Review PSSC Chapter 30.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Read and study PSSC 31-1 through 31-2, pp. 572-574.	277	Discuss assignment, problem 3.		3		Induced Current. Relative Motion.
Read and study PSSC 31-3, pp. 574-578.	278	Discuss assignment.		8		Magnetic Flux Change.
Read and study PSSC 31-4 through 31-5, pp. 579-580.	279	Discuss assignment, problems 15,16,21.	13	14,16,17	15,21	Induced EMF. Direction of Induced EMF.
Read and study PSSC 31-6 through 31-7, pp. 580-585.	280	Discuss assignments, problem 24.		19,20,22	24	Electric Fields Around Changing Magentic Fluxes. Magnetic Fields Around Changing Electric Fluxes.
Read and study PSSC 31-8 through 31-9, pp. 586-590.	281	Discuss assignment, problems 28,30,31.	31	28,30		Mechanism of Electromagnetic Radiation. Electromagnetic Spectrum.
Review PSSC Chapters 26-31.	282	Review PSSC Chapters 26-31				Review.
Continue Review PSSC Chapters 26-31.	283	Continued review PSSC Chapters 26-31.				Review.
Study for PSSC test, Chapters 26-31.	284	Test chapters 26-31 PSSC.				Test.
Open Day	285	Open Day (possible review of test)				Open Day.
Read and study CHEMS 14-1, pp. 233-238.	286	Discuss assignment.	Ex 1,2 2,5,6	1,3,7	4	Model Atomic Theory. Laws of Definite Composition. Multiple Proportions. Faraday's Laws.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Read CHEMS Exp. 25.	287	Demonstration, CHEMS Exp. 25.				Relation Between Moles of Copper, Moles of Silver and Electrons Involved During Electrolysis.
Read and study CHEMS 14-2 through 14-3.2, pp. 239-249.	288	Discuss assignment, Ex. 14-3, 14-4.	Ex 3-5,8 17	11-13,15 9	14,16 18,19	Gas Discharge tube. e/m Ratio. Rutherford Experiment.
Read and study CHEMS 14-3.3 through 14-3.4, pp. 249-250.	289	Film: "Molecular Spectroscopy or Crystals and their Structures."	10			Spectroscopy.
Review CHEMS Chapter 14. Study for test Chapter 14.	290	Test CHEMS Chapter 14.				Test.
Read and study PSSC 32-1 through 32-2, pp. 594-601.	291	Discuss assignment, problem 1.	Do experiment IV-12 as homework. Simulated Nuclear Collisions.			Deflection of Alpha Particles. Rutherford Model of Atom. Trajectories of Alpha Particles in the Electric Field of a Nucleus.
Read and study PSSC 32-3, pp. 601-604.	292	Discussion of assignment.	2,7,13, 16	8,14	15	Angular Distribution of Scattering.
Read and study PSSC 32-4 through 32-5, pp. 605-607.	293	Discussion of assignment, problems 20,25.	21,23,27	20,22,25	24,26	More on Scattering.
Read and study PSSC 33-1 through 33-3, pp. 612-617.	294	Discussion of assignment.	2,4			Graininess of Light. Orderliness of Chance. Interference.
Read and study PSSC 33-4, pp. 617-619.	295	Demonstration of Photoelectric Effect, Film: "Photons."	1,3			Photoelectric effect.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Read and study PSSC 33-5 through 33-6, pp. 619-623.	296	Discuss assignment, problems 8,10.	9	7,8,10 11	12,13, 14	Einstein's Interpretation of Photoelectric Effect. Mechanics of Photon. Photon Momentum.
Read and study PSSC 33-7 through 33-8, pp. 624-632.	297	Discuss assignment, Film: "Interference of Photons," problem 20.		21	15,16 17,20	Photons and Electromagnetic Waves. Matter Waves.
Read and study PSSC 33-9 through 33-11.	298	Discuss assignment.		23,25	22,24	Wave Nature of Matter. Light and Matter.
Review PSSC, Chapters 32-33.	299	Test PSSC Chapters 32-33.				Test.
Read and study CHEMS 15-1.1 through 15-1.2, pp. 253-259.	300	Discuss assignment. Demonstration of Spectroscope.	Ex 1-3	1		Periodic Table - Light Energy Hydrogen Spectrum.
Read and study CHEMS 15-1.3 through 15-1.5, pp. 259-263.	301	Discuss assignment.	Ex 4,5 5,6	7,8	4,9	Energy levels. Quantum Numbers and Orbitals.
Read and study CHEMS 15-1.6 through 15-2.2, pp. 263-267.	302	Discuss assignment, Film: "The Hydrogen Atom as Viewed by Quantum Mechanics."	10,11			Hydorgen Atom - Many Electron Atoms.
Read and study CHEMS 15-3 through 15-3.3, pp. 267-271.	303	Discuss assignment, Film: "Ionization Energy."	Ex 6	12-15	16	Ionization energy.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Read and study CHEMS 15-3.4, pp. 271-272.	304	Discuss assignment and review.				Fourth Row Periodic Table.
Study CHEMS Chapter 15 for Test.	305	Test CHEMS Chapter 15.				Test.
Read and study PSSC 34-1 through 34-2, pp. 638-645.	306	Discuss assignment, problem 2.	7,8	2	3,4	Experiments of Franck and Hertz. Atomic Energy Levels. Excitation and Emission.
Read and study PSSC 34-3 through 34-4, pp. 645-649.	307	Film: "Franck-Hertz Experiments," Discuss assignment, problem 16.	14	15,16,17		Absorption Spectra. Energy Levels of Hydrogen.
Read and study PSSC 34-5, pp. 649-652.	308	Discuss assignment, problem 20.		20,22	21,24	The Orgin of Energy Levels.
Read and study PSSC 34-6 through 34-7, pp. 652-657.	309	Discuss assignment.	18,19,23			Wave Theory of Hydrogen Energy Levels.
Study PSSC, Chapters 32-34.	310	Test PSSC Chapters 32-34.				Test.
Read and study CHEMS 16-1 through 16-1.2, pp. 274-278.	311	Discuss assignment, Film: "Chemical Bonding."	2,3	1		Covalent Bond.
Read and study CHEMS 16-1.3 through 16-2.7, pp. 278-286.	312	Discuss assignment.	Ex 1-5, 10,11	6-9		Representation of Chemical Bond. Bonding Capacity 2nd Row. Predictions of Molecular Formulas.
Read and study CHEMS 16-3 through 16-3.4, pp. 286-290.	313	Discuss assignment.	Ex 6	12,13		Trends in Bond Types Covalent and Ionic.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Read and study CHEMS 16-4 through 16-4.7, pp. 290-294.	314	Discuss assignment, Film: "Shapes and Properties of Molecules."	15	16-18	14,19	Molecular Structure.
Read and study CHEMS 16-5 through 16-5.2.	315	Discuss assignment.		20,21		Double Bonds and Isomers.
Review CHEMS Chapter 16 for Test.	316	Test CHEMS Chapter 16.				Test.
Read and study CHEMS 17-1 through 17-1.3, pp. 301-306.	317	Discuss assignment.	Ex 1, 1	2-4	5	Van der Waals and Covalent Bonding in Solids. Metals and their Properties.
Read CHEMS Exp. 27 I-V.	318	CHEMS Exp. 27. I to V.				The Packing of Atoms or Ions in Crystals.
Read and study CHEMS 17-2 through 17-2.3, pp. 306-311.	319	Discuss assignment.	Ex 2	6-8		Molecular Solids. Network Solids and Alloys.
Finish Exp. 27, VI and VII.	320	Exp. 27, VI and VII.				Packing of Ions in Crystals.
Read and study CHEMS 17-2.4, pp. 311-312.	321	Discuss assignment.		9-11		Ionic Solids.
Read and study CHEMS 17-2.5 through 17-2.6, pp. 312-317.	322	Discuss assignment.	12	13,16	14,15	Polar moleclues. Hydrogen Bonding.
Review CHEMS Chapter 17.	323	Film: "Crystals and their Structures," Review CHEMS Chapter 17.				Review.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	PROBLEMS II	PROBLEMS III	TOPIC
Study Test CHEMS Chapter 17.	324	Test CHEMS Chapter 17.				Test.
Study Test CHEMS Chapters 14-17.	325	Test CHEMS Chapters 14-17.				Test.
Read and study CHEMS 18-1 through 18-2.3, pp. 321-325.	326	Discuss assignment.	Ex 1-3, 1-3	4-6	7,8	Molecular Structure Ethyl Group.
Read and study CHEMS 18-2.3 through 18-3.1, pp. 325-332.	327	Discuss assignment.	Ex 4,5 9			Some Chemistry of Organic Compounds.
Read CHEMS Exp. 28.	328	CHEMS Exp. 28.				Some Reactions of Hydrocarbons and of Alcohols.
Read and study CHEMS 18-3.2 through 18-3.5, pp. 332-339.	329	Films: "Mechanism of Organic Reactions," "Synthesis of Organic Compound."	Ex 6-10 10,14,15-17	11	12,13 18,19	Reactions, Oxidation.
Read CHEMS Exp. 29.	330	CHEMS Exp. 29.				Preparation of Some Derivatives of Organic Acids.
Continue Exp. 29.	331	Continue CHEMS Exp. 29.				Continue above Exp. 29.
Read and study CHEMS 18-4 through 18-5.2, pp. 339-343.	332	Discuss assignment.	Ex 11-14 20			Nomenclature of Hydrocarbons.
Read and study CHEMS 18-5.3, pp. 343-346.	333	Discuss assignment.		21	22	Benzene Derivatives.

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Read and study CHEMS 18-6, pp. 346-349.	334	Discuss assignment.	Ex 15			Polymers.
Review CHEMS Chapter 18, Test.	335	Test CHEMS Chapter 18.				Test.
Read and study CHEMS 19-1, pp. 352-356.	336	Discussion.	Ex 1,2 2,3	1,4	5,6	Electron Configuration.
Read CHEM Exp. 30.	337	CHEMS Exp. 30.				Electrolysis of KI.
Read and study CHEMS 19-2 through 19-2.3, pp. 356-358.	338	Discussion. Film: "Bromine-Element from the Sea."	Ex 3-5, 10	7,9,11	8,12,13	Reduction of Halogens.
Read and study CHEMS 19-2.4 through 19-2.6, pp. 358-362.	339	Discussion.	Ex 6,14	15-17,19 20	18	Positive Oxidation States. Fluorine.
Read CHEMS Exp. 31.	340	CHEMS Exp. 31.				Chemistry of Iodine.
Read and study CHEMS 22-1, pp. 387-392.	341	Discuss assignment.	Ex 1-5, 1	2,3		Introduction, Definition Properties.
Read CHEMS Exp. 39.	342	CHEMS Exp. 39.				Complex Salts.
Read and study CHEMS 22-2 through 22-2.3, pp. 392-396.	343	Discuss Exp. 39.	4	5-7		Complex Ions.
Read and study CHEMS 22-2.4 through 22-2.5, pp. 396-398.	344	Discuss assignment.	Ex 6,7			Naturally Occuring Complexes.
Read and study CHEMS 22-3 through 22-3.4, pp. 398-403.	335	Discuss assignment.	Ex 8,9	8-10	11	Sc-Cr

ASSIGNMENT PRIOR TO CLASS	DAY	CLASS WORK	PROBLEMS I	II	III	TOPIC
Read and study CHEMS 22-3.5 through 22-3.6, pp. 403-406.	336	Discuss assignment.	12	13,14		Mn-Co
Read and study CHEMS 22-3.7 through 22-3.10, pp. 406-409.	337	Discuss assignment.	Ex 10,17	15,16,18-20		Ni-Zn
Read CHEMS Exp. 37	338	CHEMS Exp. 37.				Ion Exchange.
Read and study CHEMS 24-1 through 241.1, pp. 422-425.	339	Discussion.	Ex 1-4			Sugars.
Read and study CHEMS 24-1.2 through 24-1.3, pp. 425-426.	340	Discussion.	Ex 5,6			Cellulose, Starch, Fats.
Read and study CHEMS 24-2, pp. 426-431.	341	Discussion.	Ex 7-10			Energy Sources in Nature.
Read and study CHEMS 24-3, pp. 431-434.	342	Discussion.				
Review CHEMS Chapter 24.	343	Film: "Biochemistry and Molecular Structure," Review CHEMS Chapter 24.				Review.
Study for Test CHEMS Chapter 24.	344	Test CHEMS Chapter 24.				Test.
Study and review final exam PSSC.	345	Final Exam PSSC.				Final Exam PSSC.
Study and review final exam CHEMS.	346	Final Exam CHEMS				Final Exam CHEMS.

SUGGESTED LAB. EXPERIMENTS

Text	Chapter	Lab Experiment
CHEMS	11	Exp. 17
CHEMS	11	Exp. 18
CHEMS	11	Exp. 19
CHEMS	12	Exp. 20
CHEMS	12	Exp. 21
CHEMS	13	Exp. 23
PSSC	12	Exp. II-1
PSSC	12	Exp. II-2
PSSC	12	Exp. II-3
PSSC	14	Exp. II-5
PSSC	15	Exp. II-6
PSSC	16	Exp. II-7
PSSC	16	Exp. II-8
PSSC	16	Exp. II-9
PSSC	16	Exp. II-10
PSSC	17	Exp. II-11
PSSC	17	Exp. II-12
PSSC	18	Exp. II-13
PSSC	18	Exp. II-14
PSSC	26	Exp. IV-1
PSSC	26	Exp. IV-2
PSSC	27	Exp. IV-3
PSSC	28	Exp. IV-7
PSSC	30	Exp. IV-10
CHEMS	14	Exp. 25
CHEMS	17	Exp. 27
CHEMS	18	Exp. 28
CHEMS	18	Exp. 29
CHEMS	19	Exp. 30
CHEMS	19	Exp. 31
CHEMS	22	Exp. 39
CHEMS	22	Exp. 37

Demonstrations

Demonstrations will be utilized from CHEMS and PSSC, as well as other sources, as the need arises and time permits.

SUGGESTED FILMS

Title	Author and School		Text and Chapter
Acid-Base Indicators	CHEMS	CHEMS	CHEMS 11
Electrochemical Cells	CHEMS	CHEMS	CHEMS 12
Nitric Acid	CHEMS	CHEMS	CHEMS 12
Introduction to Optics	Elbert P. Little	PSSC	PSSC 11
The Pressure of Light	Jerrold Zacharias	M. .T.	PSSC 14
The Speed of Light	Wm. Siebert	M.I.T.	PSSC 14
Simple Waves	John Shive	Bell Telephone Lab.	PSSC 15
Sound Waves in Air	Richard Bolt	M.I.T.	PSSC 17
Cloud Chamber	Alexander Joseph	Bronx College	PSSC 26
Coulomb's Law	E. R. Rogers	Princeton	PSSC 27
Electric Fields	Francis Bitter	M.I.T.	PSSC 27
The Millikan Experiment	Francis Friedman, Alfred Redfield	I.B.M.	PSSC 27
Coulomb's Force Constant	E. M. Rogers	Princeton	PSSC 27
Electric Lines of Force	Alexander Joseph	Bronx College	PSSC 27
Counting Electrical Charges in Motion	J. S. Strickland	PSSC	PSSC 28
Elementary Charges and Transfer of K. E.	F. L. Friedman	M.I.T.	PSSC 29

SUGGESTED FILMS (Cont.)

Title	Author and School		Text and Chapter
A Magnetic Laboratory	Dean F. Bitter	M.I.T.	PSSC 30
Electrons in a Uniform Magnetic Field	Dorothy Montgomery	Hollins College	PSSC 30
Mass of an Electron	E. M. Rogers	Princeton	PSSC 30
Molecular Spectroscopy	CHEMS	CHEMS	CHEMS 14
Photons	John G. King	M.I.T.	PSSC 33
Interference of Photons	John G. King	M.I.T.	PSSC 33
Hydrogen Atom as Viewed by Quantum Mechanics	CHEMS	CHEMS	CHEMS 15
Ionization Energy	CHEMS	CHEMS	CHEMS 15
Franck-Hertz Experiment	Byron Youtz	Reed College	PSSC 34
Covalent Bond	CHEMS	CHEMS	CHEMS 16
Shapes and Properties of Molecules	CHEMS	CHEMS	CHEMS 16
Crystals and their Structure	CHEMS	CHEMS	CHEMS 17
Mechanism of Organic Reactions	CHEMS	CHEMS	CHEMS 18
Synthesis of Organic Compounds	CHEMS	CHEMS	CHEMS 18
Bromine--Element from the Sea	CHEMS	CHEMS	CHEMS 19
Biochemistry and Molecular Structure	CHEMS	CHEMS	CHEMS 24

TESTING AND EVALUATIONS

I. Tests to be used:

A. CHEM Study achievement tests.
B. PSSC achievement tests.
C. Teacher-made tests.
D. CHEM Study and PSSC comprehensive tests.

II. Laboratory reports:

Evaluation of specified lab. reports.

III. Special projects:

Credit given for special projects and reports.

IV. Total evaluation of achievement of students:

Total evaluation of items I, II, and III above.

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Chemical Education Material Study. Teacher's Guide for Chemistry: An Experimental Science. Freeman, 1963.

Portland Oregon School District No. 1. Physics - Chemistry: A Two-Year, Teacher's Guide and Resource Book, (1963).